In another embodiment the process comprises obtaining a diolefin-containing olefinic feedstock with boiling points within the range of from 258°F to 650°F and including between 10 % and 50 % olefins, and selectively hydrogenating the diolefin-containing olefinic feedstock to saturate at least a portion of any diolefins present while not saturating most of the mono-olefins present. The selectively hydrogenated olefinic feedstock is contacted with an oligomerization catalyst in a catalytic distillation unit to produce a product having a number average molecular weight at least 20 % higher than the olefinic feedstock. The product is separated in the catalytic distillation unit into a light byproduct fraction and a heavy product fraction, wherein the heavy product fraction comprises hydrocarbons in the lube base stock range with a viscosity of greater than 2 cSt at 100°C, a viscosity index of above 80 and a pour point of less than -10°C. Nonolefinic portions of feedstock are withdrawn from the oligomerization zone and the heavy product fraction is hydrofinished.

Claim Rejections under 35 U.S.C. § 103(a)

Claims 1 and 3 – 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Huss (U.S. Patent No. 4,935,577). Applicants respectfully disagree with this rejection; therefore, this rejection is traversed.

Huss relates to oligomerization utilizing catalytic distillation techniques. In particular the process of Huss is directed to an alpha-olefin which is oligomerized in the presence of a catalyst comprising boron trifluoride, a minute amount of water in a particular adsorbent material such as silica to a product predominating in those oligomer fractions having viscosities within the lubricating oil range such as the trimer and tetramer of 1-decene. (Col. 8, lines 36-42). Huss teaches that 1-olefins having from 3 to 20 carbon atoms and preferably 8 to 12 carbon atoms or various combinations of these alpha-olefins can be used. (Col. 8, lines 49-51). Huss teaches that in particular ***trimers and tetramers*** having viscosities in the lubricating oil range are formed.

In contrast, the presently claimed invention relates to a process for making a lube base stock comprising contacting an ***olefinic feedstock with boiling points greater than 180°F***, with an oligomerization catalyst in a catalytic distillation unit to produce a product with a higher number average molecular weight than the olefinic

feedstock. An olefinic feedstock with boiling points greater than 180°F approximately corresponds to a C_{7+} feedstock. The specification defines that a lube base oil has initial boiling points of at least 572°F (300°C) (approximately corresponding to C_{17}), and a typical lube base oil has an initial boiling point above 650°F (approximately corresponding to C_{20}). (Page 7, 6th paragraph and page 8, 3rd paragraph).

In another embodiment, the presently claimed invention relates to a process for making a lube base stock comprising obtaining a diolefin-containing olefinic feedstock with boiling points within the range of from ***258°F to 650°F***, selectively hydrogenating the diolefin-containing olefinic feedstock to saturate at least a portion of any diolefins present while not saturating most of the mono-olefins present, and contacting the selectively hydrogenated olefinic feedstock with an oligomerization catalyst in a catalytic distillation unit to produce a product having a number average molecular weight at least 20% higher than the olefinic feedstock. An olefinic feedstock with boiling points in the range of 258°F to 650°F approximately corresponds to a C_8 to C_{20} feedstock.

According to the presently claimed invention, high quality lube oils are obtained by oligomerizing a minimum number of monomers. (page 8, 3rd paragraph). Applicants respectfully submit that since lube base stocks are C_{17+} to C_{20+} products, they can be produced from a C_{8+} feedstock in a single oligomerization step. Accordingly, in the processes of the presently claimed invention, lube base stocks are being produced in a single oligomerization step from the claimed olefinic feedstocks (i.e., a feedstock with a boiling point of greater than 180°F and a feedstock with a boiling point range of 258°F to 650°F). A single oligomerization produces high quality lubricant products and avoids excessive branching in the lube oil, which reduces the viscosity index. (page 8, 3rd paragraph).

It is respectfully submitted that the presently claimed processes for producing lube base stocks by oligomerizing a feedstock with a boiling point of greater than 180°F and oligomerizing a feedstock with a boiling point range of 258°F to 650°F in a catalytic distillation unit are significantly different from the process of Huss. As explained above, Huss teaches oligomerizing 1-olefins having from 3 to 20 carbon atoms. Applicants respectfully submit that making lube base stocks from the olefinic

feedstock of Huss requires multiple oligomerization steps. Accordingly, Huss teaches oligomerizing 1-olefins having from 3 to 20 carbon atoms to provide ***trimers and tetramers*** having viscosities in the lubricating oil range. Applicants respectfully submit that lube base oil products formed from trimers and tetramers may have reduced viscosity indexes due to excessive branching. Since the process of Huss requires multiple oligomerization steps forming trimers and tetramers, Applicants respectfully submit that Huss does not teach or suggest the presently claimed process.

Claims 1 and 3 – 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang (U.S. Patent No. 4,678,645) in view of Huss. Applicants respectfully disagree with this rejection; therefore, this rejection is traversed.

As explained above, Huss teaches oligomerizing 1-olefins having from 3 to 20 carbon atoms to provide oligomer fractions having viscosities with the lubricating oil range such as the trimer and tetramer of 1-decene. (Col. 8, lines 36-42).

Chang relates to a method and apparatus for producing distillate and/or lubes from a feed comprising C_3/C_4 hydrocarbons, such as LPG. The process of Chang uses two oligomerization zones, thus providing at least two oligomerizations of the light C_3/C_4 feed.

It is respectfully submitted that even if there were some suggestion or motivation to combine Huss and Chang and a reasonable expectation of success, the references when combined do not teach or suggest all the claim limitations of the presently claimed invention. Even when combined, Huss and Chang do not teach or suggest the presently claimed processes for producing lube base stocks by oligomerizing a feedstock with a boiling point of greater than 180°F and oligomerizing a feedstock with a boiling point range of 258°F to 650°F in a catalytic distillation unit. As explained above, it is an important aspect of the presently claimed invention that the feedstock is heavy enough that multiple oligomerization steps are not required to provide a lube base stock. The processes of both Huss and Chang require multiple oligomerization steps to make lube base stocks from the light feeds. Since the processes of Huss and Chang requires multiple oligomerization steps, Applicants respectfully submit that even if combined, Huss and Chang do not teach or suggest the presently claimed process.

Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Huss in view of Sweeney (U.S. Patent No. 4,527,004). Applicants respectfully disagree with this rejection; therefore, this rejection is traversed.

As explained above, Huss teaches oligomerizing 1-olefins having from 3 to 20 carbon atoms to provide oligomer fractions having viscosities with the lubricating oil range such as the trimer and tetramer of 1-decene. (Col. 8, lines 36-42).

Sweeney teaches a process for purifying predominantly straight chain olefins having from 5 to 50 carbon atoms. Sweeney teaches that the process may be utilized to purify C_5-C_{25} alpha-olefins obtained from a Fischer Tropsch process.

It is respectfully submitted that even if there were some suggestion or motivation to combine Huss and Sweeney and a reasonable expectation of success, the references when combined do not teach or suggest all the claim limitations of the presently claimed invention. Even when combined, Huss and Sweeney do not teach or suggest the presently claimed processes of producing lube base stocks by oligomerizing a feedstock with a boiling point of greater than 180°F and oligomerizing a feedstock with a boiling point range of 258°F to 650°F in a catalytic distillation unit. As explained above, it is an important aspect of the presently claimed invention that the feedstock is heavy enough that multiple oligomerization steps are not required to provide a lube base stock, and also as explained above, the process of Huss requires multiple oligomerization steps to make lube base stocks from the light feeds. Sweeney merely teaches a purification process for olefins, which may be utilized to purify Fischer Tropsch olefins. Accordingly, Applicants respectfully submit that even if combined Huss and Sweeney do not teach or suggest the presently claimed process.

Therefore, withdrawal of the obviousness rejections is respectfully requested.

Conclusion

For the reasons noted above, the art of record does not disclose or suggest the inventive concept of the present invention as defined by the claims.

In view of the foregoing remarks, reconsideration of the claims and allowance of the subject application is earnestly solicited. The Examiner is invited to contact the

undersigned at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted,

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